

Orbit Determination of LRO at the Moon

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Abstract

The orbit determination of LRO is particularly important because the mission is designed to select landing sites for future robotic and human landings. For these purposes the program needs an accurate geodetic model of the Moon that provides the best knowledge of the positions of features on the surface, including the far side, and the gravity field to enable spacecraft to return to, or visit, a particular location. LRO is expected to provide this information. The baseline tracking system for LRO is S-band with Doppler accuracy of ~1 mm/s for approx. 20 hours per day but this will not be accurate enough for the LRO requirements which are estimated to be $\pm 50\text{m}$ or better in along track position. One-way laser ranging at 10 cm precision has been added to the spacecraft to assist in orbit determination, and in conjunction with the laser altimeter (LOLA) at 10 cm accuracy is expected to provide the position of LRO and, by inference, the position of surface features to the desired accuracy. Important aspects of LRO orbit determination are gravity model improvement, improvement of spacecraft timing and pointing knowledge, and laser altimetry and laser tracking of LRO are expected to be critical components.